

Name: _____ Period: _____ Date: _____

IB Biology Internal Assessment

Investigating the effect of a factor on catalase

Aim:

In this lab you will investigate how **substrate concentration** (H_2O_2) affects the catalase's reaction rate.

To do this experiment, many teams of students will carry out one set of trials using different substrate concentrations (20%, 40%, 60%, 80% and 100%) with the potato extract prepared previously. The volume of O_2 produced will be measured to determine the rate of reaction.

At the end of the lab, experimental results will be pooled and the class, as a whole, will generate data. You will use this data to produce a **LAB REPORT**. Each report is **individual** and will be assessed for **DCP** and **CE**

Materials per team:

- clamp stand (x1)
- clamp (x1)
- 250ml flask (x1)
- rubber stopper (x1)
- rubber tubing
- 100ml graduated cylinder (x1)
- 25ml graduated cylinder (x1)
- 10ml graduated cylinder (x1)
- 500ml beaker (x1)
- 250ml beaker (x1)
- 500ml potato extract
- 30ml of hydrogen peroxide (as sold, 3% solution – same as 10 volumes)
- stop watch or clear view of a clock with a second hand
- pipette (x1)
- spoon (x1)
- pH paper

Making the potato extract:

- 200 g potato
 - 800 ml of water
- 1) Cut clean potatoes into chunks
 - 2) Place the potato chunks in the blender and add the water.
 - 3) Puree in the blender.
 - 4) Filter potato puree to get as much fluid as possible. This fluid contains the enzyme **catalase**, among many other things that were stored inside the cells of the potato.

PROCEDURES

- 1) Set up the equipment as demonstrated in class.
- 2) Start by making the 20% solution:
 - Measure the H_2O_2 with the 10ml graduated cylinder.
 - Add the H_2O_2 to the 25ml graduated cylinder (avoid the contact between the H_2O_2 and the cylinder walls)
 - Complete with water until you get 10ml of liquid (use the pipette to help).
 - Your 20% H_2O_2 solution is ready
- 3) Read the water volume in the upside down graduated cylinder. This will be your reference.

Name: _____ Period: _____ Date: _____

- 4) Add 100ml of potato extract to the flask. Check the pH using the pH strip.
- 5) Hold the rubber stopper with one hand and the H_2O_2 solution with the other.
- 6) Pour the solution into the flask quickly and carefully and seal the flask with the rubber stopper as fast as you can to avoid any loss of gas. Time the reaction for 1 minute. Be precise in your timing.
- 7) Record how much gas is produced in 1 minute by subtracting the new volume of water from the previous volume measured.
- 7) Rinse the flask well to remove any H_2O_2 left.
- 8) Repeat steps 2-7 with the other solutions.
- 9) Clean up your work station when you are done.

Variables:

Independent


- Different H_2O_2 concentrations will be used during the experiment (20%, 40%, 60%, 80% and 100%)

Dependant

- The volume of O_2 gas produced will be measured by comparing the total volume of water inside the upside down graduated cylinder before and after the H_2O_2 solution was added.

Controlled

- The potato extract and the H_2O_2 solution will be maintained at room temperature (around 20°C) to prevent catalase from denaturing.
- The time in which the gas volume will be read is limited to one minute for all concentrations.
- The amount of potato extract will be limited to 100ml for all concentrations.
- The amount of solution added to the potato extract will be limited to 10ml.
- To prevent any gas leakage the top of the 250 ml flask containing the substrate concentration will be closed with a rubber stopper
- The pH of the extract should be around 6 throughout the experiment (pH paper strips will be used before each trial to detect any variations)
- To avoid contamination, the flask used will be rinsed after each trial.



Your Lab Report must include:

- Title
- Results (quantitative and qualitative)
- Conclusion
- Evaluation